4/PRTS

ROLLING MILL

~~WITH SUPPORT PLATES~~

The invention relates to a rolling mill having support plates or platforms which are provided on the operating side of the roll stands and which are displaced transversely to the axes of the rolls. For replacing working roll sets by being displaced transversely and, thereby, for receiving the working roll sets from the roll stands, these support plates are outfitted, in particular, with rail pairs and are located adjacent to a mill floor level to be able to transport the working rolls back and forth. The rolling mill further has trenches which are arranged upstream of respective roll stands on the operating side and have a base which is outfitted with run-out rails, in particular, for removal of back-up rolls.

Such a rolling mill with support plates, which are displaced transversely, i.e., in a rolling direction or in a direction opposite the rolling direction, are disclosed in DE 43 21 663 A1. The trenches, which are arranged between the roll stands and the transversely displaceable support plate line, are overlapped by pivotal flaps. For replacement of the working rolls, the flaps occupy a horizontal position while for replacing the back-up rolls, they pivot out to free a trench for introducing back-up rolls sets. The working rolls are dragged by a traction machine from the roll stand over the flaps up to the support plates , with both the flaps and the support plates being outfitted with corresponding rail pairs. Finally, as a result of the transverse displacement of the support plates, a new working roll set is deposited on a parallel rail pair of each support plate, is pushed in front of a roll stand and is

introduced in the roll stand. The traction machine can, if needed, to take over, after a further transverse displacement of the support plates, the used working roll sets and deliver them in a workshop.

In this known rolling mill with trenches which are closed with flaps, the working rolls must be displaced between the roll stands and separate support plates over respective flaps up to the support plates. Only when the working rolls are on the support plates, the transverse displacement and replacement of the working rolls take place.

Proceeding from this state of the art, the object of the invention is to provide a rolling mill with which the replacement of working rolls takes place within a shorter time period.

This object is achieved with a rolling mill with features of claim 1. Advantageous further developments are set forth in dependent claims.

The basic idea consists in that the transversely displaceable support plates are displaced with a transport device from a position for replacing the working rolls into a position for replacing the back-up rolls and back, by being sunk transverse to the rolling direction in a direction of a control pulpit beneath the mill floor level and adjacent to a trench region. In the position for replacing the working rolls, the

support plates are arranged immediately adjacent to the roll stands and form themselves an upper closure of the trenches. The transverse displacement takes place directly in front of the rolling mill train. Thereby, the displacement path of the working rolls can be reduced, whereby the necessary time for the working roll replacement can be reduced to a minimum. The support plates are sunk at an angle through the trench region from a first position in which the support plates are located immediately adjacent to the roll stands above the trenches, to a second position in which they are located before the trench (viewing from the control pulpit) beneath the mill floor level, while retaining their alignment during the transportation movement.

As a transport device for the support plates, e.g., a displaceable lifting platform can be used, which can provide for sinking of the plates beneath the mill floor level and for displacement out of the trench region necessary for the back-up roll sets.

According to a particularly advantageous embodiment, the transport device has an undercarriage with rolls. The support plates themselves are displaceably arranged with respect to an undercarriage table in order to enable the transverse displacement along the support plate line. On the base of a respective trench, there are provided ramps which rise in a direction of the roll stand. With this

undercarriage/ramps solution, there is provided a transport device that is easily displaceable and is substantially failure-free.

A particularly advantageous solution consists in that the undercarriage is displaced by a piston-cylinder unit that is also used for transporting the back-up roll sets on the trench base. In this way, no further drive for the transport device is necessary.

In order to convert a horizontal power movement of the piston-cylinder unit into an ascending movement along the ramps, the piston or a piston-extending traverse is rotatably connected with a support rod the other end of which is rotatably supported on the bottom of the undercarriage table.

In order to transversely displace the support plates in the position of working roll replacement, pressure is applied thereto. The separate support plates need not to be connected with each other. They are rather movable with a side edge to a side edge.

The invention will now be explained in detail with reference to the drawings. The drawings show:

Fig. 1 a side view of a rolling mill with roll stands and an immediately adjoining the stands, line of support plates with separate sinking and displaceable support plates;

Fig. 2 a plan view of the rolling mill shown in Fig. 1;

Fig. 3 a cross-sectional view along line B-B in Fig. 1 with a support plate in a position in which it is used for changing the working rolls; and

Fig. 4 a cross-sectional view along line A-A in Fig. 1 with a support plate in a position in which it is used for changing the back-up rolls.

Figs. 1 and 2 show a rolling mill with, here, seven finishing roll stands F1-F7. ON the operating side BS (AS designates the opposite drive side) of the stand line, immediately laterally adjacent thereto, a line 1 of transversely displaceable support plates 2 is provided. Each support plate 2 is equipped with rail pairs 3 extending along roll axes. In the condition shown in the Figures, a used working roll set 4′ has been pulled out on a support plate 2a, while new working roll sets 5 are awaiting to be inserted on respective adjoining support plate 2b and are brought in corresponding roll stands by transverse displacement in the line.

As shown in Fig. 2, ends 6 of the support plates 2, remote from the roll stands, are located adjacent to the mill floor level 7, which is likewise provided with roll pairs (not shown) for insertion and removal of working roll sets 4, 5 with corresponding traction machines 8 (see Figs. 3 and 4). The transportation with traction machines 8 can be effected, e.g., according to the method disclosed in DE 43 21 663 A1 in accordance with which tooth gears of a traction machine

engage tooth racks arranged along the rails. Alternatively, the function of a traction machine can be performed by a hydraulic cylinder.

Details of the invention will be explained with reference to Figs. 3 and 4.

On the operating side BS or in the direction of a control pulpit, adjacent to a roll stand Fi with a working roll set 4 and a back-up roll set 9, there is provided a trench 10 the base 11 of which is equipped with run-out rails (not shown) for the back-up roll set 9. In the position for changing the working roll set, which is shown in Fig. 3, the trench 10 is covered by a support plate 2. The support plate 2 flush covers the trench10 between the roll stand Fi and the adjoining mill floor level 7. The traction machines 8, which transport the working roll sets 4 in and out, can travel over the mill floor level 7 immediately up to the support plate 2. The used roll sets 4'' can be immediately pulled over corresponding rail tracks into the mill shop WW and then be displaced back from there. The support plates 2 themselves can be transported with a transport device 12 in the horizontal position shown in Fig. 3, and be held there. The transport device 12, which is formed as undercarriage 13, consists essentially of a table 14 with a roller pair 15a, 15b arranged thereon. The table 14 itself has rails 17 on its upper surface 16 (see Fig. 2) and which extend transverse to the roll axes and form a line, with the tables being pushed against each other. The support plates 2 have corresponding

rollers 18 displaceable along the rail tracks for transverse displacement. In order to prevent a lateral tilting, a guide 19 is provided between a respective support plate 2 and the table upper surface 16. In the position shown in Fig. 3, the under-carriage 13 is located in an end position on two ramp pairs 20a, 20b or tapered rails, e.g., with inclination of about 20°.

The position of the support plate 2 for changing the back-up rolls will be explained with reference to Fig. 4. Because the trench is filled with the lower portion of the back-up roll set 9, the support plate 2 is sunk with inclination downwardly in the region 21 that adjoins a region of the trench 10.

The undercarriage 13 is displaced along the ramp pair 20a, 20b away from the roll stand Fi below the floor level 7, with the guide cams 22 facilitating the displacement. The guide cams 22 prevent a sidewise displacement of the table 14 during the sinking movement and in the sunk position.

The displacement of the carriage 13 and, thereby, of the support plate 2 is effected with a piston-cylinder unit 23 that also displaces the back-up roll set 9. A piston-extending traverse or adapter 24 is connected with the back-up roll set 9 and displaces the set 9 during a horizontal movement along run-out rails in the trench 10 and displaces back-up roll set back after an exchange of back-up rolls. Simultaneously with the displacement of the back-up roll set 9 out, the

undercarriage 13 is displaced from an elevated position into a sunk position below the floor level 7. To this end, a push rod 25, which is rotatably secured in the center of the bottom of the table 14, engages the undercarriage and pulls it from the ramps onto the sunk support plates. An end of the floor level that immediately adjoins the trench 10 is provided with a flap 31.

For raising and lowering the rollers 15a, 15b of the undercarriage 13 with respect to the ramps 20a, 20b, the front ramp pair 20a is offset relative to the rear ramp pair 20b. The run-out lines along the taped rails 30 can be seen particularly clear in Fig. 2. Here, e.g., the support plate 2c, which is associated with the second finishing roll stand F2, is shown as being sunk in its run-out position, e.g., transverse to the roll direction while all of the other support plates 2 are shown in the working roll exchange position. For clarification, there are shown on the support plate 2c of the first stand F1, a working roll set 4 that was moved out and, next to it, a new working roll set 5.

The support plates, preferably, are not connected with each other but are arranged side-by-side next to each other. They are moved back and forth with two pressure units 26a, 26b which engage, respectively, opposite ends of a line 1 of support plates. The plates 2 roll along rail pairs 17 provided in the table 14 of the undercarriage 13. Side guide rollers 27, which roll along a guide unit 19 provided

on the table 14, prevent tilting. Each support plate 2 is associated with an adjustment unit 28 the position of which is variably adjustable and with which a respective support plate 2 can be adjusted with respect to a stand Fi in the position for changing the working rolls. The pressure, piston-cylinder units 26a, 26b are covered, in the embodiment shown in the drawings, with cover sheets 29 (see Fig. 1).

The proposed solution insures that the line of support plates is located immediately adjacent to the finishing roll stands, and that the transportation path for the working rolls is a short one. For opening of the trenches which are covered by the support plate, the support plates are sunk and linearly displaced with a transportation device. The working roll exchange is effected by a transverse displacement of the support plates, and for back-up roll exchange the support plates are sunk and a displaced in a direction of the control pulpit.

List of Reference Numerals:

1 Line of support plates

2. Support plates

3 Rail pair

4 Working roll set (4′ and 4′′ used working rolls)

5 New working roll set

6 End of support plates

7 Mill floor level

8 Traction machine

9 Back-up roll set

10 Trench

11 Trench base

12 Transport device

13 Undercarriage

14 Table

15 Rollers (Roll pair 15a, 15b)

16 Upper surface of the table

17 Rails in the upper table surface

18 Rollers

19 Guide

20 Ramps (ramp pair 2a, 2b)

21 Region adjoining a trench region

22 Guide cams

23 Piston — Cylinder Unit

24 Traverse

25 Push rod

26 Displacement unit, in particular, a pressure unit (unit pair 26a, 26b)

27 Side guide rollers

28 Adjustment unit

29 Cover sheets

30 Taped rails

31 Flap

F1-F7 (Fi) finishing roll stands

BS Operational side

AS drive side

WW plant workshop